Exhibit 2

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HEWLETT PACKARD ENTERPRISE COMPANY and
CISCO SYSTEMS, INC.,
Petitioners,

v.

COBBLESTONE WIRELESS LLC,
Patent Owner.

Case IPR2024-00707
Patent 7,924,802

EXHIBIT 2001
DECLARATION OF PROFESSOR TODOR V. COOKLEV, PH.D.

TABLE OF CONTENTS

I. INTRODUCTION

1. My name is Todor V. Cooklev. I am an expert in mobile telecommunications and wireless technology. I have been retained as an expert witness to provide my independent opinion regarding certain matters at issue in *inter partes* review of U.S. Patent No. 7,924,802 ("the '802 patent") in IPR2024-00707. I have been retained by Cobblestone Wireless LLC ("Cobblestone"), the Patent Owner in the above proceedings. Petitioners are Hewlett Packard Enterprise Company and Cisco Systems Inc. (collectively "Petitioner").

2. For my work on this case, I am being compensated for my time at my typical consulting rate of $700 per hour. I am also being reimbursed for expenses that I incur during the course of this work. My compensation does not depend on the substance of my opinions or the outcome of any issues in this case.

3. My analysis of the materials produced in this matter is ongoing and I will continue to review any new material as it is provided. This declaration represents only those opinions I have formed to date. I reserve the right to amend or supplement my opinions based on additional documents or evidence I am presented, including without limitation any arguments or expert declarations advanced by Petitioner in this case.

4. I am not a legal expert and offer no opinions on the law. However, I have been informed by counsel of the various legal standards that apply, and I have applied those standards in arriving at my conclusions.

II. QUALIFICATIONS

5. I am currently the Professor in the Department of Electrical and Computer Engineering at Purdue University in Fort Wayne, Indiana, where I have had several faculty and administrative positions.

6. My teaching responsibilities have included courses in communication systems and networks, signals and systems, software-defined radio, and digital signal processing. My research interests include most aspects of modern wireless systems, including hardware and software architectures. A significant part of my research is specifically focused on standards-related issues. I have received a number of research grants in these areas.

7. I am a named inventor on more than thirty U.S. patents, most of which relate to the hardware or software aspects of communication systems. In 1999, I was inducted into the Purdue Inventors Hall of Fame. I have also authored and co-authored more than one hundred peer-reviewed articles. A list of my publications and patents appears in my *curriculum vitae* attached as Exhibit 2002.

8. I graduated from the Technical University of Sofia, Bulgaria in 1988 with a Diploma of Engineering in the field of Electrical Engineering. I graduated

from Tokyo Institute of Technology in Tokyo, Japan in 1995 with a Doctor of Philosophy (Ph.D.) degree in Electrical Engineering.

9. My experience is not only academic. I have worked in the computer and data communications industries. I worked in research and development, but also contributed to product firmware and software development, including digital signal processing algorithms for communication systems.

10. I have contributed to the development of several major standards for communication systems and numerous amendments, including Bluetooth, DSL, Wi-Fi, cellular, and military radio systems. I have participated in many meetings of standards committees and I have chaired some committee meetings and served in other leadership roles.

11. Around 1998 - 1999 I participated in the Bluetooth Special Interest Group (SIG). I was among the authors of the Bluetooth 1.0 specification, contributing to the Host Controller Interface (HCI). In 1999 I participated in the group that established the license agreement between the Bluetooth SIG and the IEEE 802. Subsequently I joined IEEE 802.

12. From 2000 to 2002, and from 2005 to 2008 I was a Voting Member of the IEEE 802.11 Working Group and attended almost all meetings during those years. Generally, meetings were held every other month. During that time, I prepared, submitted, and presented documents to IEEE 802.11. On a couple of

occasions, I was involved in the drafting of liaison letters between 802.11 and other standards committees.

13. From 2005-2006 to around 2007-2008 I was Chair of a Study Group within 802.11 until I convinced the entire Working Group to approve the creation of another Task Group. For my work I received an IEEE Standards Association award in 2012.

14. Even after 2008 I continued my involvement with 802.11. For example, until about 2020 I was reviewing and voting on most amendments to IEEE 802.11.

15. Consequently, I have extensive experience in connection with the development of the IEEE 802.11 standard that forms the basis of the references in both of the Petition's grounds.

16. In 2020 I was elected to serve on the Board of Governors of the IEEE Standards Association as Member-at-Large. The Board of Governors provides overall leadership of the IEEE Standards Association.

17. Since 2017 I have been the Series Editor for Wireless and Radio Communications for the IEEE Communications Standards Magazine (which is the premier journal in the field of communication standards). As member of the Editorial Board I coordinate the review of scholarly manuscripts that relate to the most recent communications standards.

18. A detailed record of my professional qualifications is set forth in Exhibit 2002, which is my *curriculum vitae*, including a list of publications, awards, courses I teach in electrical and computer engineering subjects, research grants, and professional activities. My *curriculum vitae* also lists the depositions, hearings, and trial at which I have testified.

III. LEGAL STANDARDS

19. I am not a lawyer, and I do not intend to offer any opinions as to the interpretation of the law. When considering the '083 patent and stating my opinions, I rely on the following legal standards as described to me by the attorneys for Smart Mobile.

A. Priority Date Of a Patent.

20. I understand that the analysis of alleged obviousness of the Patent should be performed from the perspective of a POSITA as of the priority date of the Patent. The Patent claims priority to January 23, 2008. My opinions in this matter are from the perspective of a POSITA as of that date; however, my opinions do not change if the priority date is slightly changed.

B. Level Of Ordinary Skill In The Art.

21. My opinions in this declaration are based on the understandings of a person of ordinary skill in the art, as of the time of the invention. I understand that the person of ordinary skill in the art is a hypothetical person who is presumed to

have known the relevant art at the time of the invention. By "relevant," I mean relevant to the challenged claim of the '083 patent.

22. I understand that various factors should be considered when determining the person of ordinary skill in the art in connection with a particular patent. I understand that these factors include, without limitation, the type of problems encountered in the art, the prior solutions to those problems found in the prior art references, the rapidity with which innovations are made, the sophistication of the technology, the level of education of active workers in the field, and my own experience working with those of skill in the art at the time of the invention.

23. I am readily familiar with the level of ordinary skill in the art as of the priority date of the Patent. My qualifications at that time far exceeded that of a POSITA, and I had worked with, as well as supervised, many POSITA's throughout my work in the field.

24. Dr. Negus opines that a POSITA "would have had at least a Bachelor's degree in Electrical Engineering or an equivalent field, and at least two years of work experience in developing wireless communications product based upon IEEE 802 standards. Alternatively, a POSITA would have had a more advanced degree, such as a Master's degree in Electrical Engineering or an equivalent field, combined with at least one year of work experience in developing

wireless communications products based upon IEEE 802 Standards." Ex. 1003 [Negus-Decl.] ¶ 25. For the purpose of this declaration, I will apply the same definition of the level of skill of a POSITA.

25. Based on my experience, education, and training, I met the definition of a POSITA as of the priority date of the Patent. My qualifications at that time far exceeded that of a POSITA, and I had worked with, as well as supervised, many POSITA's throughout my work in the field. My opinions concerning the '802 Patent claims and the prior art are from the perspective of a POSITA, as set forth above.

26. As further discussed below, my opinions as stated in this declaration are valid even if the Board adopts a slightly different level of ordinary skill in the art.

C. Claim Construction.

27. I understand that claims in a patent-at-issue in an IPR are generally interpreted according to the district court-type claim construction.

28. I further understand that claim terms are interpreted as they would have been interpreted by a person of ordinary skill in the art at the time of the invention, in light of the specification and the patent's prosecution history in the patent office.

D. Obviousness Legal Standard.

29. I understand that a patent claim is unpatentable if the claimed invention would have been obvious to a person of ordinary skill in the art at the time of the invention.

30. I understand that an obviousness analysis involves comparing a claim to the prior art to determine whether the claimed invention would have been obvious to a person of ordinary skill in the art at the time of the invention in view of the prior art and in light of the general knowledge in the art as a whole. I also understand that obviousness is ultimately a legal conclusion based on underlying facts of four general types, all of which must be considered: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) any objective indicia of non-obviousness, including any praise of the invention. Objective indicia of non-obviousness may include, for example, commercial success of an embodiment, a long-felt need, skepticism, failure by others to find the solution provided by the claimed invention, copying by others of the subject matter of the claim invention, unexpected results of the claimed invention, acceptance of others and industry praise, and licensing of the patents.

31. I also understand that obviousness may be established under certain circumstances by combining or modifying the teachings of the prior art. However,

I have been informed that a claim is not proved obvious merely by demonstrating that each of the elements was independently known in the prior art. I have been informed that many, if not all, inventions rely on building blocks already previously known, and claimed discoveries almost of necessity will likely be combinations of what is already known. I have been informed that it is important to identify whether a reason existed at the time of the invention that would have motivated a person of ordinary skill in the art in the relevant field to combine the known elements in the way the claimed invention does. Specific teachings, suggestions, or motivations to combine any first prior art reference with a second prior art reference can be explicit or implicit, but must have existed before the date of purported invention. I understand that prior art references themselves may be one source of a specific teaching or suggestion to combine features of the prior art, but that such suggestions or motivations to combine art may come from the knowledge that a person of ordinary skill in the art would have had.

32. I understand that a reference may be relied upon for all that it teaches, including uses beyond its primary purpose, but also including teachings that lead away from the invention. I understand that a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, although the mere disclosure of alternative designs does not teach away.

33. I further understand that whether there is a reasonable expectation of success in combining references in a particular way is also relevant to the analysis.

34. I understand that it is improper to use hindsight to combine references or elements of references to reconstruct the invention using the claims as a guide. My analysis of the prior art is made from the perspective of a person of ordinary skill in the art at the time of the invention.

35. I am not offering any legal opinions in this declaration nor am I qualified to do so. I only consider such legal standards in framing my opinions and conclusions as well as placing assertions made by Petitioner in the Petition into the proper context. Additionally, from a subject matter perspective, I understand that the petitioner always has the burden of persuasion regarding a challenge of patentability of an invention under an inter partes review.

IV. CLAIMS-AT-ISSUE

36. I understand that Petitioner has challenged claims 1-9 of the ’802 Patent. As only claim 1 is in independent form, my opinions here only address claim 1.

V. OPINIONS

A. The Meaning Of "Center Frequency" In Light Of The Patent's Specification Is The Carrier Signal Frequency The Baseband Signal Is Up-converted To.

37. Claim 1 requires transmitting information across two frequency ranges, each with a different "***center frequency***." More specifically, "first information" must be transmitted across a "first frequency range having a ***first center frequency***," and simultaneously, "second information" must be transmitted across a "second frequency range having a ***second center frequency greater than the first center frequency***." Ex. 1001 ['802] cl. 1. Thus, the claim requires two frequency ranges, each with a different "center frequency" with one "center frequency" greater than the other. The '802's specification confirms that the claimed "center frequency" refers to the carrier signal frequency the baseband signal is upconverted to. To have two, different, "center frequencies," there must therefore be two up-conversions to two carrier signals with different frequencies.

38. I will first provide a brief discussion of the underlying technology to better illustrate the meaning of "center frequency."

39. A baseband signal represents the information to be transmitted in its raw form. It can be either an analog electrical waveform (e.g., voice) or a digital signal. Baseband signals generally include frequencies that are very low and close to zero. However, antennas cannot emit zero-frequency signals and are ineffective

when the frequency is low. Therefore, the frequency of many baseband signals is too low for them to be effectively or feasibly transmitted over a wireless system. As another issue, frequency ranges are typically assigned (*e.g.*, by a governmental regulatory body) such that baseband frequencies are not available for use.

40. Therefore, the baseband signal often cannot be transmitted wirelessly. It would instead have to be modulated on a signal at a much higher frequency prior to transmission. This higher frequency signal is called a carrier signal. In such instances, the baseband signal is said to be "up-converted" to the carrier signal's higher frequency. As I will explain later in my declaration, the "center frequency" is the carrier signal frequency to which the baseband signal is up-converted prior to transmission.

41. The distinction between a baseband signal and a "center frequency" (interchangeably referred to in the '802 as a carrier frequency) to which the baseband signal is up-converted is shown in the figure below. The top image shows a baseband signal with a low frequency[1]. The middle image shows the carrier signal with a much higher "center frequency" f_c. In practice this carrier signal is generated by a local oscillator (LO). The third image shows the carrier

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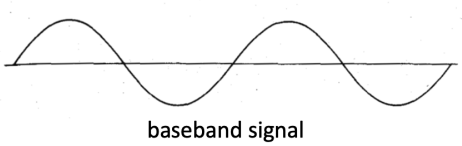
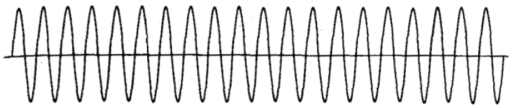
[1] For ease of illustration, the shown signal is real-valued, even though baseband signals are generally complex-valued.

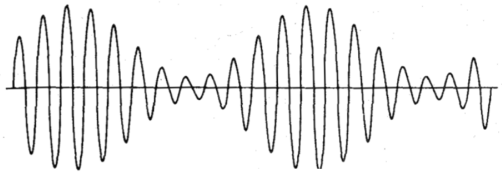
signal after it has been amplitude modulated by the baseband signal. This modulated carrier signal is what would be transmitted out of the transmitter.



baseband signal



carrier signal with center frequency (carrier frequency) f_c



carrier signal with center frequency (carrier frequency) f_c
amplitude modulated by the baseband signal

42. The '802 patent mentions "center frequency" more than 90 times, including in its background of the invention and in all of its embodiments. Every time it is used, it means the frequency of the carrier signal to which the baseband signal is upconverted.

43. In the background of the invention, the '802 patent explains that the baseband signal is "up-convert[ed]" to the frequency of the "local oscillator (LO)". Ex. 1001 ['802] 1:25-27. The output of this up-conversion is amplified and transmitted through the antenna. *Id.*, 27-30. The '802 patent then explains that its prior art Figure 1 transmitter was "limited to up-converting a [baseband] signal to one center frequency (or modulation frequency), which is the LO frequency." *Id.*,

1:30-32. Thus, from the very outset of its disclosure, the '802 patent uses "center frequency" as the carrier signal frequency the baseband signal upconverted to.

44. In light of the background discussion in the '802 patent, the use of two "center frequencies" as claimed is a major focus of the invention. The '802 patent explains that in the prior art the '802 patent sought to improve upon, baseband signals were upconverted to a single carrier frequency and, thus, the amount of information that could be transmitted was limited by the bandwidth around that single up-conversion frequency. Ex. 1001 ['802] 1:32-35. To maximize throughput, the prior art increased the bandwidth around the single up-conversion frequency. Ex. 1001 ['802] 1:25-32.

45. In contrast to the prior art, which sought to improve throughput by increasing bandwidth around a single center frequency, the '802 patent increases throughput in an altogether different fashion. It increases throughput by, *inter alia*, disclosing up-conversion to two, different, center frequencies (rather than just one). By utilizing two, different, center frequencies, the bandwidth can effectively be increased by aggregating the capacities of two different communication channels together.

46. In accord with this insight, every embodiment of the '802 patent similarly uses "center frequency" to mean the carrier signal frequency the

baseband signal is upconverted to. For example, Figure 2, annotated below, is illustrative:

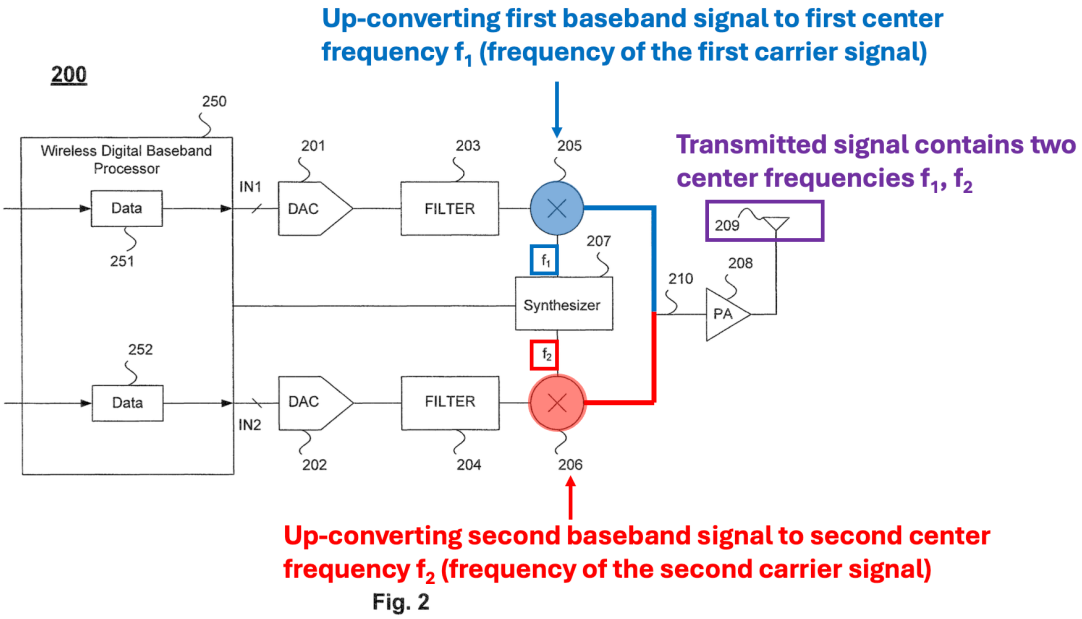


Fig. 2

47. Figure 2 discloses a wireless digital baseband processor 250 that provides data via two separate digital baseband signals 251 and 252. Ex. 1001 ['802] 5:60-66. After being converted to analog in DAC 201/202 and filtered, signals 251 and 252 are fed into respective up-converters 205 and 206. Up-converter 205 accordingly upconverts data 251 into a first "center frequency" f_1 and, similarly, data 252 is up-converted by element 206 into a second "center frequency" f_2. *Id.*, 6:22-56. These two up-converted signals are then combined, amplified and transmitted. *Id.*, 7:4-14. Thus, the '802 patent uses "center frequencies" f_1 and f_2 to mean the carrier signal frequencies the two baseband signals 251 and 252 are upconverted to.

48. The resulting signal is shown schematically in the annotated version of the '802 patent's Figure 3. The blue region shows the baseband signal upconverted to the first carrier signal with a first center frequency f_1. The red region shows the baseband signal upconverted to the second carrier signal with a second center frequency f_2.

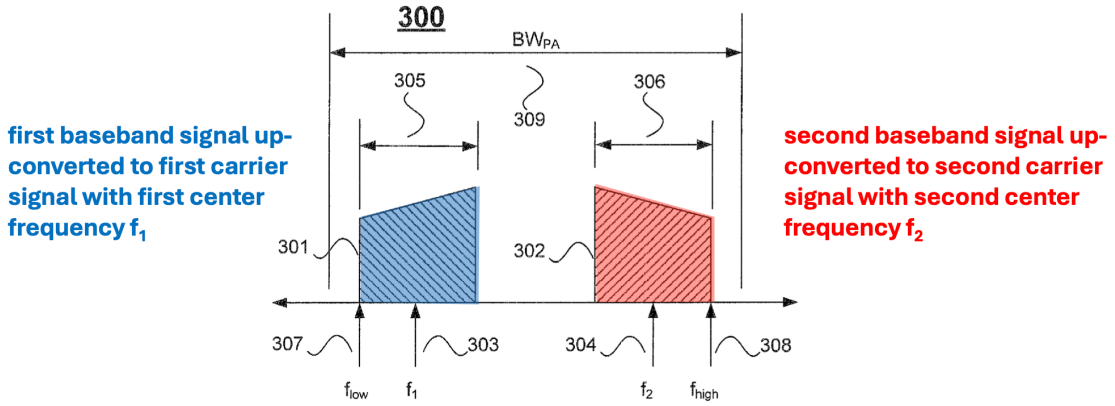


Fig. 3

49. This very same meaning of "center frequency" as the carrier frequency the baseband signal is upconverted to is reflected in the '802 patent's other embodiments as well. *See, e.g.,* Ex. 1001 ['802] 9:9-57 (Figure 6 embodiment); 12:33-58 (Figure 10 embodiment).

50. Additionally, the '802 uses the terms "center frequency" and "carrier frequency" interchangeably, further reinforcing that "center frequency" means the carrier signal frequency the baseband signal is up-converted to. For example, in connection with its Figure 8 embodiment, the '802 explains:

> This example provides a transmitter for sending the same data across a communication channel at ***two different RF carrier frequencies*** to improve reliability and/or increase the range of the system. … Up-converter 812 includes a second input coupled to an output of a synthesizer 814, which may be used ***to up-convert the analog signal to a RF center frequency f_1***. Similarly, up-converter 813 includes a second input coupled to another output of a synthesizer 814 (or to a different synthesizer), which may be used to ***up-convert the analog signal to a RF center frequency f_2***. … The output of power amplifier 815 is coupled to antenna 850 to ***transmit the digital data simultaneously as an electromagnetic signal using two different RF carrier frequencies.***
>
> Ex. 1001 ['802] 10:64-11:20.

51. As can be seen, here, the '802 patent is using "center frequency" and "carrier frequency" interchangeably. Specifically, the '802 patent explains that it obtains a signal with two different "carrier frequencies" through combining signals that are separately up-converted to "center frequencies" f_1 and f_2. "Carrier frequency" is a term of art and, like "center frequency" in the '802 patent, refers to the carrier signal frequency the baseband signal is upconverted to.

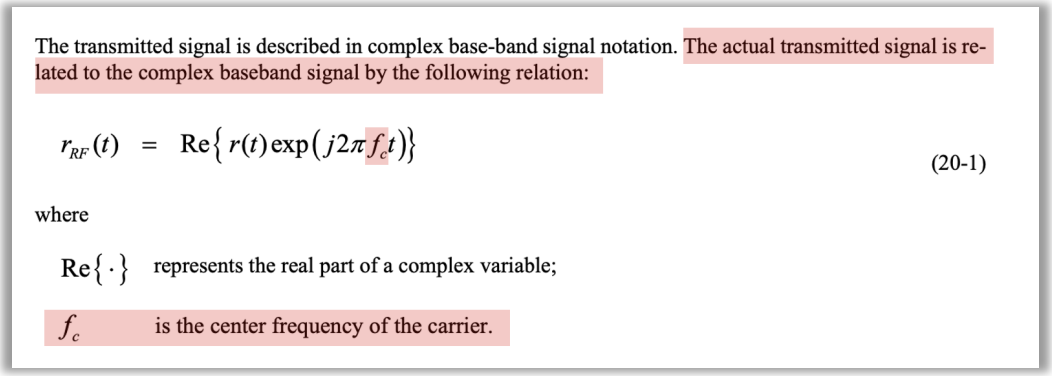
52. For the foregoing reasons, a POSITA would understand that "center frequency" in light of the '802 patent's specification means the carrier signal frequency the baseband signal is upconverted to.

B. The 40 MHz Channel In IEEE 802.11n D2.0 Does Not Disclose Two "Center Frequenc[ies]" As Claimed In The '802 Patent.

53. In Ground 1, Petitioners rely on the 40 MHz channel disclosed in IEEE 802.11n D2.0 as disclosing two "center frequencies." Pet., 29-36. Petitioners rely in the alternative on two specific data formats to transmit data within the 40 MHz channel of IEEE 802.11n D2.0: the HT duplicate and non-HT duplicate data formats. Pet., 29-36. The IEEE 802.11n D2.0 is clear that the data in the 40 MHz channel for each of the HT duplicate and non-HT duplicate formats is represented by a single baseband signal that is subsequently up-converted to a single carrier signal which has a single "center frequency" (carrier frequency).

54. The standard discloses that the baseband signal in the 40 MHz channel for the HT duplicate format is represented by $r_{HT-DATA}^{i_{TX}}(t)$, which is a single baseband signal obtained by the standard's equation 20-60. Ex. 1004 [802.11n D2.0] 279 (cited by Pet., 30). Similarly, the standard discloses that the baseband signal in the 40 MHz channel for the non-HT duplicate format is represented by $r_{LEG-DUP}^{i_{TX}}(t-nT_{SYM})$, which is a single baseband signal obtained by the standard's equation 20-61. Ex. 1004 [802.11n D2.0] 280 (cited by Pet., 31). The standard is clear that those equations represent a single baseband signal. Ex. 1004 [802.11n D2.0] 240 ("The transmitted signal is described in complex base-band signal notation.").

55. As the standard explains, the signal actually transmitted by the transmitter is obtained by up-converting this single, complex baseband signal on a single carrier signal with a single center frequency f_c:



The transmitted signal is described in complex base-band signal notation. The actual transmitted signal is related to the complex baseband signal by the following relation:

$$r_{RF}(t) = \mathrm{Re}\{ r(t)\exp(j2\pi f_c t)\} \quad (20\text{-}1)$$

where

$\mathrm{Re}\{\cdot\}$ represents the real part of a complex variable;

f_c is the center frequency of the carrier.

Ex. 1004 [802.11n D2.0] 240-241.

56. In the equation above, $r_{RF}(t)$ is the real-valued signal that is transmitted from the antenna. It is obtained by up-converting the complex baseband signal r(t) to the frequency f_c of the carrier signal. The complex baseband signal r(t) is the baseband signal obtained from either equation 20-60 for HT duplicate format, or equation 20-61 for non-HT duplicate format. As is clear from the above, regardless of which format is used, a single baseband signal is up-converted to a single carrier signal with a single center frequency.

57. This is further confirmed by the standard's explanation of the "overview" of the encoding process, where it explains that the single baseband signal of the 40 MHz channel is up-converted in equation 20-1 to "***the*** center frequency of ***the*** desired carrier signal":

> ***Up-convert the resulting complex baseband waveform*** associated with each transmit chain to an RF signal according to ***the center frequency of the desired channel*** and transmit. Refer to 20.3.7 (Mathematical description of signals) for details.

Ex. 1004 [802.11n D2.0] 237. Thus, the standard makes clear that only one "center frequency" is utilized.

58. In fact, the 40 MHz channel relied upon by Petitioners from IEEE 802.1n D2.0 is an attempt at increasing throughput through increasing bandwidth, which is what the '802 patent distinguished as its prior art.

59. The old IEEE 802.11-2007 standard provided channels that were 20 MHz in bandwidth. *See* Ex. 1005 [802.11-2007] at p. 594 ("The allowed values of the DATARATE are 6, 9, 12, 18, 24, 36, 48, or 54 Mb/s for 20 MHz channel spacing"). The newer IEEE 802.11n standard relied upon by Petitioner for the disclosure of the 40 MHz channel "is the high throughput amendment to the 802.11 standard." Ex. 1006 [Perahia] 101. One of the ways IEEE 802.11n increased throughput was to increase the channel bandwidth from 20 MHz to 40 MHz. Ex. 1004 [802.11n D2.0] 292 ("When using 20 MHz channels it uses channels defined in 17.3.8.3 (5 GHz band) or 18.4.6 (2.4 GHz band). When using 40 MHz channels, it can operate in the channels defined in 20.3.14.1 (Channel allocation in the 2.4 GHz Band) and 20.3.14.2 (Channel allocation in the 5 GHz

band).”); *see also* Ex. 1006 [Perahia] 101(“The other significant increase in data rate is derived from the new 40MHz channel width.”); Pet., 14 (“As particularly relevant here, IEEE 802.11n D2.0 introduced 40 MHz channels ….”).

60. But increasing channel bandwidth around a single center frequency is precisely the approach the ’802 patent explained is its prior art. The ’802 patent explained that in its Figure 1 prior art, the transmitters were “limited to up-converting a signal to one center frequency (or modulation frequency).” Ex. 1001 [’802] 1:29-31. Thus, the ’802 patent explains, “the amount of information transmitted around the center frequency is limited by the bandwidth of the transmitter around the center frequency,” which limits the amount of data that can be transmitted. Ex. 1001 [’802] 1:32-35. The ’802 patent then explains that “[t]ypical prior art approaches to improving the information capacity in a wireless communication system involve maximizing the bandwidth around the center frequency to increase the amount of information that may be modulated onto the carrier frequency.” Ex. 1001 [’802] 1:25-32.

61. Thus, the IEEE 802.11n D2.0’s approach of increasing the channel bandwidth from 20 MHz to 40 MHz is precisely the prior art discussed in the ’802 patent.

62. I would also like to address another aspect of the standard for completeness. The standard refers to the 20 MHz subparts of the 40 MHz channel

as "primary" and "secondary" channels within the 40 MHz channel. Ex. 1004 [IEEE 802.11n-D2.0] at 292 ("The 40 MHz channels are specified by two fields: (Nprimary_ch, Secondary)"). This allows the standard to specify what is transmitted in different portions of the 40 MHz channel for various reasons. For example, to allow legacy devices that were designed for the old 20 MHz channel to operate with the new 40 MHz channel, the standard provides that in the non-HT duplicate format, the primary and secondary 20 MHz portions of the 40 MHz channel are duplicates of each other. Ex. 1004 [IEEE 802.11n-D2.0] at p. 301 ("And furthermore, if the FORMAT field is set to NON_HT and CH_BANDWIDTH indicates NON_HT_CBW40, follow the transmit procedure as in Clause 17 duplicated on both channels.").

63. This logical division of the 40 MHz channel, however, does not change the fact that, as I discussed above, the entire signal of the 40 MHz channel, containing both the 20 MHz primary and secondary portions within it, is a single baseband signal that is up-converted to a single center frequency. *See* ¶¶ 54-57, *supra*. I understand that Dr. Negus also agrees with me on this point. Ex. 1003 [Negus-Decl.] ¶318 ("a POSITA would understand that the 'first information' and the 'second information' are disclosed by either of the '*HT duplicate format*' and '*non-HT duplicate format*' as being ***within a single composite complex baseband signal*** ….").

64. Therefore, this is not a case where the two 20 MHz primary and secondary portions of the 40 MHz channel are separately up-converted to a different carrier signal with a different center frequency. Instead, as explained (*see* ¶¶ 54-57, *supra*), the standard is clear that the data within the 40 MHz channel is contained within a single baseband signal up-converted to a single frequency. Ex. 1004 [802.11n D2.0] 240-241, 237.

65. Therefore, for the reasons I explained above, the 40 MHz channel within IEEE 802.11n D2.0 does not disclose two "center frequenc[ies]" as claimed.

C. The 40 MHz Channel In Shearer Does Not Disclose Two "Center Frequenc[ies]" As Claimed In The '802 Patent.

66. Petitioners' Ground 2 relies on Shearer alone. Pet., 22. As I will explain below, this ground fails for reasons similar to Petitioners' ground 1.

67. Shearer explains that the "legacy" IEEE 802.11a/g systems utilized 20 MHz channels. Ex. 1007 [Shearer] [0044]. Shearer then discloses a method to create a 40 MHz channel. *Id*., [0047]. Shearer creates this new 40 MHz channel by aggregating two legacy 20 MHz channels. *Id*. Shearer Figure 7 shows three ways of combining the legacy 20 MHz channels. *Id*. All three ways shown in Figure 7 are materially the same for the purposes of this discussion as they only differ in which subcarriers are set to zero as guard subcarriers within the channel. *Id*.

68. As I will explain below, Shearer obtains the new 40 MHz channel by first creating the baseband signals for each of the legacy 20 MHz channels, then aggregating the two baseband signals to create a single baseband signal for the new 40 MHz channel, and then upconverting the single baseband signal to a single carrier signal with a single center frequency. Thus, Shearer's 40 MHz channel does not disclose two center frequencies because its transmitted signal does not contain two carriers with two different frequencies.

69. Shearer's Figure 3, reproduced below, discloses a legacy transmitter for transmitting a 20 MHz baseband signal. Ex. 1007 [Shearer] [0040].

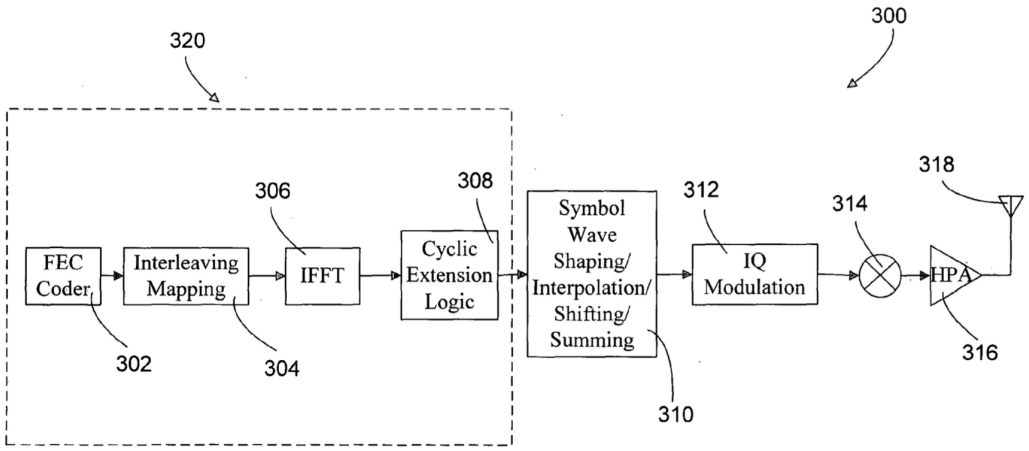


Figure 3

70. Once the baseband signal is created, it is "sent to mixer 314 where it is upconverted to ***the*** desired transmit frequency." Ex. 1007 [0043]. Thus, Shearer's Figure 3 discloses a single "center frequency."

71. To create the 40 MHz signal, Shearer duplicates element 320 to create two 20 MHz baseband signals, which are then combined in element 310 into a single 40 MHz baseband signal. That single 40 MHz baseband signal is then up-converted in mixer 314 to a single carrier signal with a single center frequency. Shearer's Figure 13, reproduced below, discloses the parallel components to create the baseband signals for the upper and lower portions of the 40 MHz channel. Ex. 1007 [Shearer] [0062].

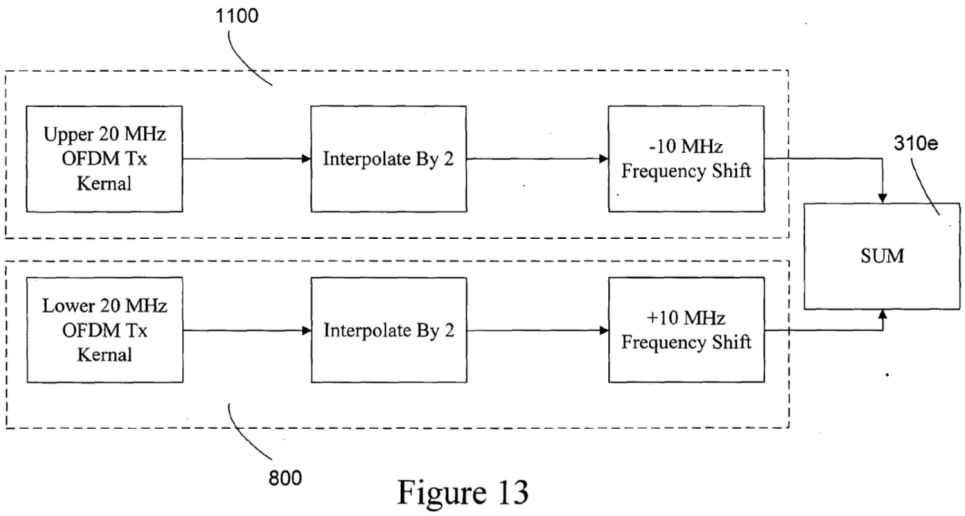


Figure 13

72. The baseband signal for the lower 20 MHz portion of the 40 MHz signal is created in element 1100. Ex. 1007 [Shearer] [0062]. Similarly, the baseband signal for the upper 20 MHz portion of the 40 MHz signal is created in element 800. *Id.* This is shown schematically in Shearer's Figures 10 and 12, reproduced below:

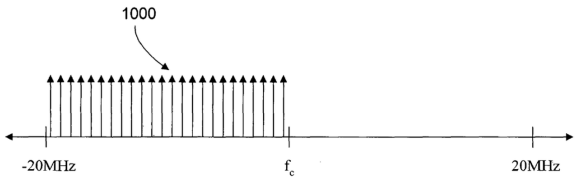


Figure 10

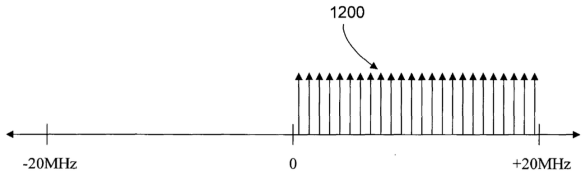


Figure 12

73. These two baseband signals are then "aggregated in adder 310e" to create a 40 MHz baseband signal. Ex. 1007 [Shearer] [0062]. The aggregated 40 MHz baseband signal is shown in Figure 14, reproduced below:

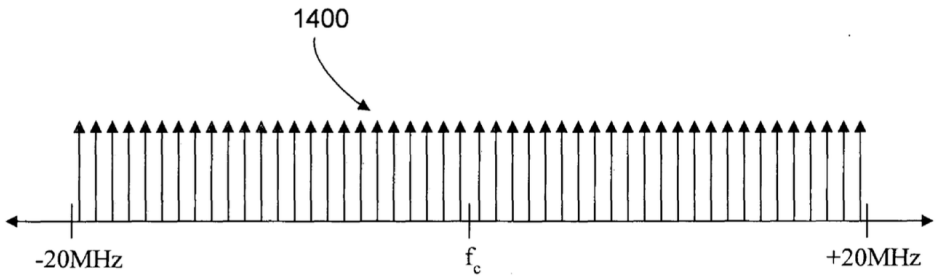


Figure 14

74. Note that, as Dr Negus also showed in his annotation (Ex. 1003 [Negus-Decl.] ¶ 428), a POSITA would understand that the summer 310e in Figure 13 corresponds to element 310 in Figure 3. Ex. 1007 [Shearer] [0012] ("In the figures, like reference numerals designate corresponding parts throughout the

different views."); [0041] ("The symbol wave shaper/interpolator/shifter/summer 310 also comprises interpolation, shifting, and summing functionality as described below."); [0060] ("Interpolator stage 310c corresponds to shaper/interpolator/shifter/summer 310 of FIG. 3. … Frequency shift stage 310d corresponds to shaper/interpolator/shifter 310 of FIG. 3.").

75. Thus, as shown in Fig. 3, after the two 20 MHz baseband signals are separately produced and aggregated in element 310e, the produced 40 MHz baseband signal is upconverted by mixer 314 to a single carrier with a single center frequency.

76. Therefore, for the reasons I explained above, Shearer does not disclose two "center frequenc[ies]" as claimed in the '802 patent.

VI. CONCLUSION

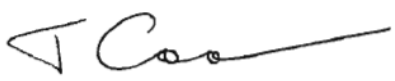
77. For the foregoing reasons, based on my expertise and experience and the record of this case that I have reviewed, it is my opinion that the challenged claims are not shown to be disclosed or obvious.

78. I understand that my opinions discussed above support a legal conclusion that the challenged claims are nonobvious.

In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required, I will appear for cross-examination within the United States during the time allotted.

I hereby declare that all statements made herein of my own knowledge are true and all statements made herein on information and belief were and are believed by me to be true, and that all statements herein were and are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that any such willful false statements may jeopardize the validity of the application or any patents issued thereon.

Respectfully Submitted,



June 27, 2024

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Todor V. Cooklev, Ph.D.